

BULLETIN
OF THE
State University of New Mexico

WHOLE NUMBER 112

GEOLOGICAL SERIES 3

MAY, 1923

NO. 5

**OIL AND GAS IN NEW MEXICO
IN 1923**

BY

ROBERT W. ELLIS

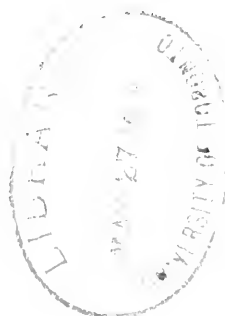
PROFESSOR OF GEOLOGY IN THE STATE UNIVERSITY
AND STATE GEOLOGIST

Published Quarterly by the State University of New Mexico.
Entered May 1, 1906, at Albuquerque, N. M., as Second Class Matter,
Under Act of Congress of July 18, 1894.

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**ALBUQUERQUE, NEW MEXICO
1923**

Second Quarter, June Issue



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OIL AND GAS IN NEW MEXICO IN 1923

BY ROBERT W. ELLIS

INTRODUCTION.

During the two years following the summer of 1920 the interest in New Mexico as an oil-producing State gradually died down. The number of new wells started decreased and many of those that had been started were abandoned. Well-conducted efforts to find oil in paying quantities in different parts of the State had failed. Some of the most favorable structures had seemed to prove barren of oil.

It is evident, however, that, in the meantime, all hope of finding oil in the State had not been given up by some of the large producers of oil. The rather startling developments near Farmington by the Midwest Refining Co. were but the culmination of a sustained effort to locate a successful well. The presence of gas in large quantities near Aztec was being demonstrated, and at least local interest had been maintained in the oil possibilities of that region.

With the bringing in of a well of noticeable and apparently of commercial proportions, the public interest was clutched and started in high gear. Newspaper reports were red with glowing accounts of the situation, and the more conservative individuals became aware that something unusual had happened.

Naturally, in other parts of the State, interest in oil development was awakened. Especially those areas where prospects had before seemed the most encouraging began again to show activity in oil propositions. Quay County and the Pecos region, Luna County and the Tularosa Basin, each felt a quickened impulse toward the demonstration of the oil possibilities of its own respective area.

Reports of the results at the "Hogback" well having spread to other states, many inquiries have been received by the writer, concerning the present oil conditions in the State. In order to facilitate the process of transmitting information desired in these inquiries, the writer has undertaken to set forth a summary of conditions, as far as is practicable under a rather

limited opportunity for observation and collation of data. His thanks are due to various chambers of commerce and others who have sent in numerous statements of local conditions; also to the representatives of oil companies who have given valuable information pertaining to results attained through the investigations of these companies. He acknowledges a complimentary trip to the San Juan region furnished by the University of New Mexico.

Many of the wells named in this report have been mentioned in "The Oil Situation in New Mexico," Bulletin 101, University Publications, to which the reader is referred.

THE NORTHEASTERN SECTION

Few developments are reported from the northeastern section of the State. In Union County no drilling had been done for some time, till the spring of 1923. The well on Ute Creek, near Bueyeros, was carried down to granite, as is supposed.

The McGee No. 1, near Tucumcari, was finally abandoned, after reaching a depth of over 4,000 feet. The San Jon and the Endee wells were abandoned and the rigs are moved away.

The Fowler Oil Co., in March, 1923, were preparing for drilling 21 miles northwest of Clovis.

The Spaulding Dome Oil Co. had drilled to a depth of 335 feet, 23 miles north of Fort Sumner, when drilling was suspended temporarily. It was expected that drilling would be resumed here early in the year.

Late in the spring of 1923 drilling was more active in Quay County.

The Dripping Springs well, sec. 25, T. 13 N., R. 31 W., being drilled by the Standard Petroleum Company, was reported as at a depth of 2,850 feet, in Pennsylvanian limestone. There has been considerable trouble with water, which it is now hoped has been overcome, so that drilling may soon be resumed. Some oil-showing is apparent.

The Williams-McClintock Oil Syndicate is drilling in sec. 8, T. 10 N., R. 29 E. On May 22, 1923, this well was reported to be 188 feet deep, oil having been found at 93 feet. The oil-bearing formation is said to be a dark shale, alternating with a very hard sandstone, which continues to the present depth.

The Ogle Oil Company is reported to have drilled 682 feet in sec. 13, T. 9 N., R. 27 E. A showing of oil appeared at this

depth, in a hard red sandstone. This test is for a shallow oil—about 1,000 feet—in Permian strata.

H. T. McGee is making a test near Logan, sec. 9, T. 13 N., R. 34 E., north of the Canadian River.

Scanty information could be secured on certain wells drilled in Santa Fe County. Drilling there has evidently not produced results desired. Work on a well a few miles south of Galisteo has gone on intermittently since November, 1920. This well, called the "Wood" well, now under the operation of the Commander Mining Co., was reported, on April 30, 1923, to be 2,750 feet deep. There had been several traces of oil, but owing to the difficulty of controlling the water, the amount of showing could not be determined. The well is reported as passing through 1,500 feet of Mancos shale, in which a showing of oil and gas was encountered between 700 and 800 feet. Below the shale, about 450 feet of Dakota and associated sandstones were found. Red beds succeeded, from 1,950 to 2,750 feet.

The McGill well, 2 miles west of Taiban (sec. 36, T. 3 N., R. 27 W.) was shut down for repairs early in January. The following is given as the log of this well as far as drilled by Jan. 26, 1923:

	Feet.
Gray sandstone	100
Red sandstone, clay	50
Quicksand	110
Gray and red sandstone	260
Showing of gas for the last 100 feet.	

No particular oil excitement was prevalent around Vaughn or Mountainair, where more or less interest was centered in 1920.

Work on the Pasamonte well had been suspended several months when drilling was resumed in the spring of 1923. Mr. F. M. Wiseley, trustee of the Allison Oil Interests, Clayton, N. Mex., furnished the following record of this well:

Log of Heringa well No. 1, S. E. $\frac{1}{4}$ S. E. $\frac{1}{4}$ sec. 14, T. 24 N., R. 30 E., Pasamonte, N. Mex.

	Feet.
Yellow clay	0- 15
Blue clay	15- 45
Hard "shell" (sandstone)	45- 48
Blue shale	48- 80
Hard shale, white	80- 85
Blue shale	85- 90
Hard sand, "shell"	90- 94
Blue shale	94- 110
Hard sand, white; gypsum	110- 122
Blue shale	122- 135
Hard sand, gray	135- 138
Blue shale	138- 150
Soft sandstone and shale	150- 165
Hard sand; some water	165- 185

	Feet.
Blue shale	185- 198
Soft sand; some shale	198- 215
Hard sandstone	215- 223
Sand and shale, blue	223- 229
Blue shale	229- 242
Hard sandstone, gray	242- 255
White sandstone and gypsum	255- 261
Hard sandstone	261- 296
Water sand	296- 320
Hard sandstone	320- 324
(15½-inch casing set at 321 feet.)	
Soft sand	324- 326
Hard limestone, white	326- 333
Soft limestone, light red	333- 336
Hard limestone, dark red	336- 342
Hard limestone, brown	342- 345
Soft limestone, light brown	345- 352
Hard limestone, white	352- 355
Soft limestone, white	355- 380
Limestone, white and "shells"	380- 389
Soft limestone, white, and "Austin chalk"	389- 395
Hard limestone, white, "shells" and "Austin chalk"	395- 405
Soft limestone, white, "shells" and "Austin chalk"	405- 415
White limestone, "shells" and "Austin chalk"	415- 427
Hard gray limestone and "shells"	427- 430
Soft white limestone and "Austin chalk"	430- 450
Hard gray limestone and "shells"	450- 453
Soft gray limestone	453- 465
"Shells" and limestone, gray	465- 495
Soft limestone, light red	495- 510
Red rock	510- 515
Soft limestone, light red	515- 530
Red rock	530- 550
Red shale; inclined to cave	550- 556
Red shale	556- 570
Rock, very light red	570- 585
White sandstone, soft	585- 595
Light red sand	595- 635
Red sand	635- 685
Red sandstone	685- 725
Red rock	725- 758
Water sand	758- 765
Red rock, red shale, red gumbo, light red mud and shale	765- 979
Red rock	979-1010
"Canary" shale (brown gumbo)	1010-1058
Red rock and shaly sandstone	1058-1100
(12½-inch casing set at 1058 feet)	
Red rock and shaly sandstone	1100-1190
Red sandy shale; streaks of gumbo	1190-1340
Red gumbo	1340-1394
Yellow clay	1394-1395
Light to dark brown shale	1395-1470
(10-inch casing set at 1412 feet 11 inches, in brown shale)	
Brown shale and brown sand	1470-1520
Brown sand	1520-1640
Brown sandstone; pyrite	1640-1815
Gray limestone; pyrite	1820-1825
(8¼-inch casing set at 1820 feet, in gray limestone)	
Gray sandstone and limestone	1825-1840
Gray limestone	1840-1849
Gray limestone and "shells"	1849-1883
Brown limestone	1883-1893
Hard limestone	1893-1907
Hard black limestone	1907-1932
Hard gray limestone 500,000 feet "sulphur" gas	1932-1948
Gray sand; gas, estimated at 500,000 feet	1948-1968
Hard shell, then white sand	1968-1988
Hard "shell", then gray sand; 1,000,000 feet of "ammonia" gas	1988-2016
Gray sand	2016-2031
Hard "shell"	2031-2032

	Feet.
Shale "break"	2032-2041
Blue shale, limestone and "shell"	2041-2066
"Resemblance of Pennsylvania oil sand"; good oil showing	2066-2095
Hard "shell"	2095-2096
Limestone and "shell"	2096-2120
"Shell" and white sand	2120-2142
Gray and red sand; water at 2155; quick sand at 2160	2142-2166
Quicksand	2166-2180
Hard "shell"	2180-2183
(6 $\frac{3}{4}$ -inch casing)	
Red sand and gray limestone	2183-2283
Gray sandy limestone	2283-2290
Water sand	2290-2295
Hard white sand	2295-2304
Pink limestone	2304-2314
White sand	2314-2319
Red and white sandy limestone	2319-2378
White sand; salt water	2378-2387
"Sugar" sand, or "Ford" sand	2387-2390

THE PECOS REGION.

Increased activity is showing in the Pecos region. Conditions were reported as given in the following paragraphs. The Hawkins well, 3 miles southeast of Dayton, drilled by the Kansas-New Mexico Company, was reported as being pumped and yielding 20 barrels a day on January 22, 1923. This well is about 1,000 feet deep. This company was starting another well 500 feet from this well, northeast (see. 3, T. 18 S., R. 26 E.)

The Buffalo-Roswell Company was reported drilling 22 miles east of Roswell and had reached a depth of about 2,500 feet.

S. L. Bent was making several shallow tests 15 miles north of Roswell.

The Illinois Producers Company were starting to drill near the Hawkins well.

Some oil was being produced from the Brown well and the Belt well.

The Illinois Producing and Refining Co. were building a standard rig in sec. 31, T. 18 S., R. 28 E. This company had drilled wells at Dayton and Lakewood. They struck oil in each well, but not in important amount.

Sol Stage was preparing to start a new well 300 feet south of the Brown well.

The following generalized section was given by Martin Yates, Jr., an experienced driller of Artesia:

Generalized geologic section west of Pecos River:

	Feet.
Red beds	700
Cap rock	?
Water-bearing sandstone	?
Limestone	?
Oil sand	70

THE SOUTHWESTERN SECTION.

Drilling was being continued at the Angelus well, 22 miles southeast of Deming. Early in the year this well was at a depth of 3.150 feet, "with good indications."

Log of Angelus well No. 1, N. E. $\frac{1}{4}$ S. E. $\frac{1}{4}$ sec. 8, T. 26, S., R. 8 W

	Feet.
Gravel	0 - 18
Clay	18 - 56
Sand	56 - 75
Clay and sand	75 - 89
Clay	89 - 103
Sand	103 - 113
Sand and clay	113 - 120
Clay	120 - 157
Heaving sand	157 - 157 $\frac{1}{2}$
Sand and water gravel.....	157 $\frac{1}{2}$ - 164
Sand and clay.....	164 - 179
Clay	179 - 207
Sticky clay	207 - 222
Running mud	222 - 232
Quicksand	232 - 241
Clay	241 - 249
Quicksand	249 - 268
Clay	268 - 282
Quicksand	282 - 303
Clay	303 - 314
Red clay	314 - 336
Gray clay; caving	336 - 351
Red clay	351 - 382
Red sliding clay	382 - 434
Red clay, "soapstone"	434 - 465
Red clay, sticky	465 - 523
Quicksand; heavy water flow	523 - 595
Gray sandy clay	525 - 547
Red clay	547 - 553
Gray sandy clay	553 - 580
Quicksand; heavy water flow.....	580 - 583
Gray sand and clay	583 - 589
Quicksand and water gravel; heavy flow.....	589 - 594
Sand and water	594 - 616
Gray sticky clay	616 - 630
Clay	630 - 642
Sand and gravel; heavy water flow	642 - 657
Clay and gravel	657 - 670
Black sand	670 - 700
Clay and gravel	700 - 770
Sand and gravel	770 - 800
Water, gravel and sand	800 - 885
Packed sand and boulders	885 - 920
Gravel and sand	920 - 941
Packed sand and boulders	941 - 981
Red clay and boulders	981 - 1056
Gray sand rock	1056 - 1071
Red gumbo and boulders	1071 - 1119
Red shale and gumbo	1119 - 1174
"Lime"; brown shale	1174 - 1244
"Lime" and boulders	1244 - 1325
Brown shale	1325 - 1374
Gray sand rock	1374 - 1396
Hard gumbo and boulders	1396 - 1504
Packed gray sand and gravel	1504 - 1520
Gray sand rock	1520 - 1524
Gumbo and boulders	1524 - 1560

It will be seen that the location of this well does not agree with that given on page 2^o of "The Oil Situation in New Mexico." The present data were given by the secretary of the Angelus Oil Mining Association, and are doubtless correct.

	Feet.
Brown sandy shale	1560-1567
Red gumbo	1567-1600
Hard red gumbo	1600-1665
Hard gray rock	1665-1670
Brown loose shale	1670-1728
Lime rock, gray	1728-1738
Red gypsum and gravel	1738-1754
Cement gravel	1754-1763
Clay	1764-1770
Sandy shale	1770-1775
Sand	1775-1779
Gravel	1779-1781
Clay	1781-1816
Sand and gravel	1816-1822
Clay	1822-1865
Sand	1865-1873
Clay	1873-1965
Sand	1965-2044
Clay	2044-2125
Red clay, sticky, tough	2137-2164
Red clay	2164-2194
Sticky red clay	2194-2217
Sticky red clay, with streaks of sand	2217-2230
Sticky red clay, streaked with thin "shells"	2230-2239
Dry sand mixed with red clay	2239-2257
Sandstone, streaks of red clay	2257-2268
Hard "shell"	2268
Red clay and hard sand	2268-2274
Red clay streaked with sand and thin "shells"	2274-2293
Clay and sand	2293-2304
Red coarse sand streaked with red sticky clay	2204-2213
Hard sand	2313-2315
Red clay with thin streaks of sand	2315-2325
Fine sand	2325-2332
Fine sand streaked with red clay	2332-2360
Sticky red clay	2360-2363
Hard "shell"	2363-2364
Fine sand	2364-2370
Sticky red clay	2370-2377
Medium hard "shell"	2377-2378
Fine sand	2378-2384
Sticky red clay, thin streaks of sand	2384-2395
Sticky red clay	2395-2412
Fine sand	2312-2314
Sticky red clay	2314-2320
Red clay with hard streaks of sandstone	2420-2430
Dark red clay, streaks of sandstone	2430-2440
Red clay, streaks of thin "shells"	2440-2451
Hard "shell"	2451-2454
Thin layers of red clay and rock	2454-2456
Hard "shell"	2456-2458
Dark blue shale with streaks of rock; few oil colors	2458-2462
Red clay, streaks of hard rock	2463-2468
Sticky red clay	2468-2471
Fine sand	2471-2474
Red clay, streaked sand and rock	2474-2479
Hard "shell"	2479-2481
Coarse gray sand	2481-2486
Sticky red clay	2486-2490
Hard sand rock	2490-2494
Sticky red clay	2494-2499
Hard "shell"	2499-2500
Sticky red clay	2500-2510
Hard sand	2510-2511
Hard "shell"	2511-2514
Red clay and red shale; few colors	2514-2520
Red clay, streaks of red shale and rock	2520-2525
Hard rock with thin streaks sandstone and red shale	2525-2532
Sticky red clay	2532-2544
Hard "shell"	2544-2545
Red clay, few hard streaks of rock	2545-2568
Medium hard "shell"	2568-2570
Red clay and red shale	2570-2595

	Feet.
Red clay, streaks fine sand and hard streaks of rock	2595-2605
Red clay and red shale	2605-2620
Fine hard sand	2620-2624
Red shale and red clay	2624-2640
Streaks of sand and red clay	2640-2650
Red clay and red shale, streaks of blue shale, hard sand and limestone, thin "shell" and black shale	2650-2689
Hard "shell"	2689-2691
Red clay, streaks of hard sandstone	2691-2704
Hard "shell"	2704-2707
Red clay, streaks of hard rock	2707-2712
Red clay	2712-2724
Hard rock ("shell")	2724-2725
Red clay and fine sand	2725-2710
Fine running sand	2740-2755
Hard "shell"	2755-2758
Red clay and red shale, streaks of thin "shells"	2758-2867
Fine sand streaked with thin "shell"	2867-2877
Red clay and red shale, streaks of hard sandstone	2877-2915
Fine gray sand	2915-2954
Red clay, streaks of sandstone	2954-2965
Sandstone, thin layers of red clay	2965-2970
Red clay and brown shale, streaks of sandstone	2970-3005
Sticky red clay	3005-3020
Fine gray sand	3020-3023
Red clay, streaks of hard rock	3023-3044
Black hard rock	3044-3046
Red clay, streaks of brown shale and sandstone	3046-3065
Sticky red clay, streaks of red shale and sandstone	3065-3075
Black rock; looks like black "lime"	3075-3077
Red clay and brown shale, hard streaks of sandstone	3077-3092
Red clay, thin streaks of conglomerate	3092-3100
Red clay and brown shale, streaks of red rock	3100-3108
Hard "shell"	3108-3110
Fine sand	3110-3114
Red clay and brown shale, hard streaks of sandstone	3114-3140
Red clay and brown shale	3140-3147
Hard "shell"	3147-3149
Red clay, hard streak of rock	3149-3157
Red clay and shale with hard streaks of rock	3157-3165
Fine sand	3165-3170
Red clay, streaks of brown and blue shale	3170-3188
Red clay with hard streaks of sandstone	3188-3195
Sandy red shale and hard streaks of sandstone	3195-3212
Hard rock, thin streaks of red shale	3212-3245
Hard sandstone and red shale	3245-3255
Hard rock	3255-3260
Red clay, sandstone, streaks of hard rock	3260-3340
Red clay and red shale, streaks of hard rock and sandstone	3340-3365

The Florida well also was being deepened. It was at a depth of 700 feet when last reported.

The well of the Southwestern Tularosa Basin Oil Co., 12 miles northwest of Tularosa, was down to a depth of about 3,300 feet. No development was reported for other locations in Otero County.

Several wells drilled for water about 20 miles north of Quemado are said to have considerable oil showings. One of these was abandoned as a stock well on account of the amount of oil accumulating in the well. No other wells were reported for the southwestern quarter of the State.

THE SAN JUAN REGION.

Developments in the San Juan region late in the summer of 1922 were responsible for the present renewal of interest in oil production in the State. A well drilled by the Midwest Refining Company a few miles from Shiprock was brought in with an estimated initial production of 350 barrels. While the immediate excitement created by this well has abated somewhat, there is yet a steady trend of interest toward the San Juan country in general. Since a large part of this territory lies within the boundaries of the Navajo Indian Reservation, where the process of securing leases is somewhat slow, this portion of the Basin is not being developed, except for the work of the Midwest Refining Company above referred to. Certain areas that lie outside the Reservation, however, seem likely to become the sites of active operations during the summer of 1923.

For the present, the Seven Lakes district remains rather quiet. The several wells that were drilled there a few years ago were unproductive of oil in any considerable quantities. No new wells have been reported.

Farther southeast, near Ambrosia Lake, the Texas Production Company is preparing to drill on sec. 13 (or 24), T. 15 N., R. 10. W. This structure is well-defined and had been drilled to a shallow depth in 1920.

In the southeastern part of McKinley County, drilling is being started by the Midwest Refining Company. This company has built a road into the territory of the sites of these two wells. One of these locations is on the Miguel Creek structure, Tafoya and Chavez grants. The other is in T. 14 N, R. 8 W.

On April 25, 1923, the Producers and Refiners spudded in a well 4 miles southeast of Gallup—W. side S. W. $\frac{1}{4}$ sec. 25, T. 15 N., R. 18 W.

The two wells, Mesaverde Nos. 1 and 2, near Flora Vista, drilled prior to 1920, have been abandoned.

Two wells have been drilled near Aztec since 1920, by the Aztec Oil Syndicate. In each of these wells gas was struck at about 900 feet. From one of these wells gas is being supplied to the town of Aztec. The capacity of these wells is said to be 1,000,000 to 2,000,000 cubic feet each.

Other wells productive of gas are located in the southeastern part of Ute Indian Reservation. Ute well No. 1 is located 23 miles, by road, from Farmington, up the La Plata Valley, on

sec. 35, T. 32 N., R. 14 W. Gas was encountered in this well at about 2,300 feet. Before the gas flow was finally restrained, 340 feet of casing was blown from the well. The gas also was accidentally ignited and the rig was burned. This well showed a pressure of 460 pounds while supplying gas for the boiler of a near-by drilling outfit.

Log of Ute well No. 1, Midwest Refining Co., on Ute Indian Reservation, N. Mex.

	Feet.
Sand	0- 14
Shale	14- 45
Sand	45- 60
Shale	60- 75
Dark shale and light sand	75- 110
Hard sand	110- 130
Shale, broken	130- 150
Sand, hard	150- 185
Shale, hard	205- 215
Shale; showing of oil and gas at 210 feet.....	215- 220
Sand, hard; bad hole from 225 to 230 feet.....	220- 230
Hard white sand	230- 245
Close dark sand	245- 255
"Broken"	255- 300
Hard dark sand	300- 305
Dark shale	305- 320
Shale	320- 330
White shale	330- 348
Shale	348- 358
Light hard shale	358- 373
Light hard "shell".....	373- 378
Light hard rock	378- 388
Light shale	388- 400
Sand	400- 410
Dark shale	410- 440
"Muddy" shale	440- 443
Dark shale	468- 520
(commenced on 15½-inch casing)	
Brown sandy shale	524-610
("encountered at 610 feet")	
Gray shale	610- 710
Gray shale, with hard sandy-shale streaks	710- 740
Gray shale	740- 850
Gray shale, sharp, sandy	850-1205
Gray shale	1205-1400
Brown shale	1400-1635
Gray shale	1635-1735
Black shale	1735-1910
Soft black shale	1910-2050
Gray shale; hard "shell" 2090-2095.....	2050-2100
Gray shale	2100-2190
Sand and gas	2190-2210
Sand	2210-2265
"Missing"	2265-2285
Sand; 4,000,000 cu. ft. gas	2285-2320
Sand; 4,000,000 cu. ft. gas, additional.....	2320-2325

A second well was commenced by the Midwest Refining Company, November 29, 1921. This well is located a few rods east of well No. 1, on slightly higher ground. The well is capped and has a pressure of 700 pounds. A log of well No. 2 follows:

Log of Ute well No. 2, Midwest Refining Co., sec. 35, T. 32 N., R. 14 W., N. Mex.

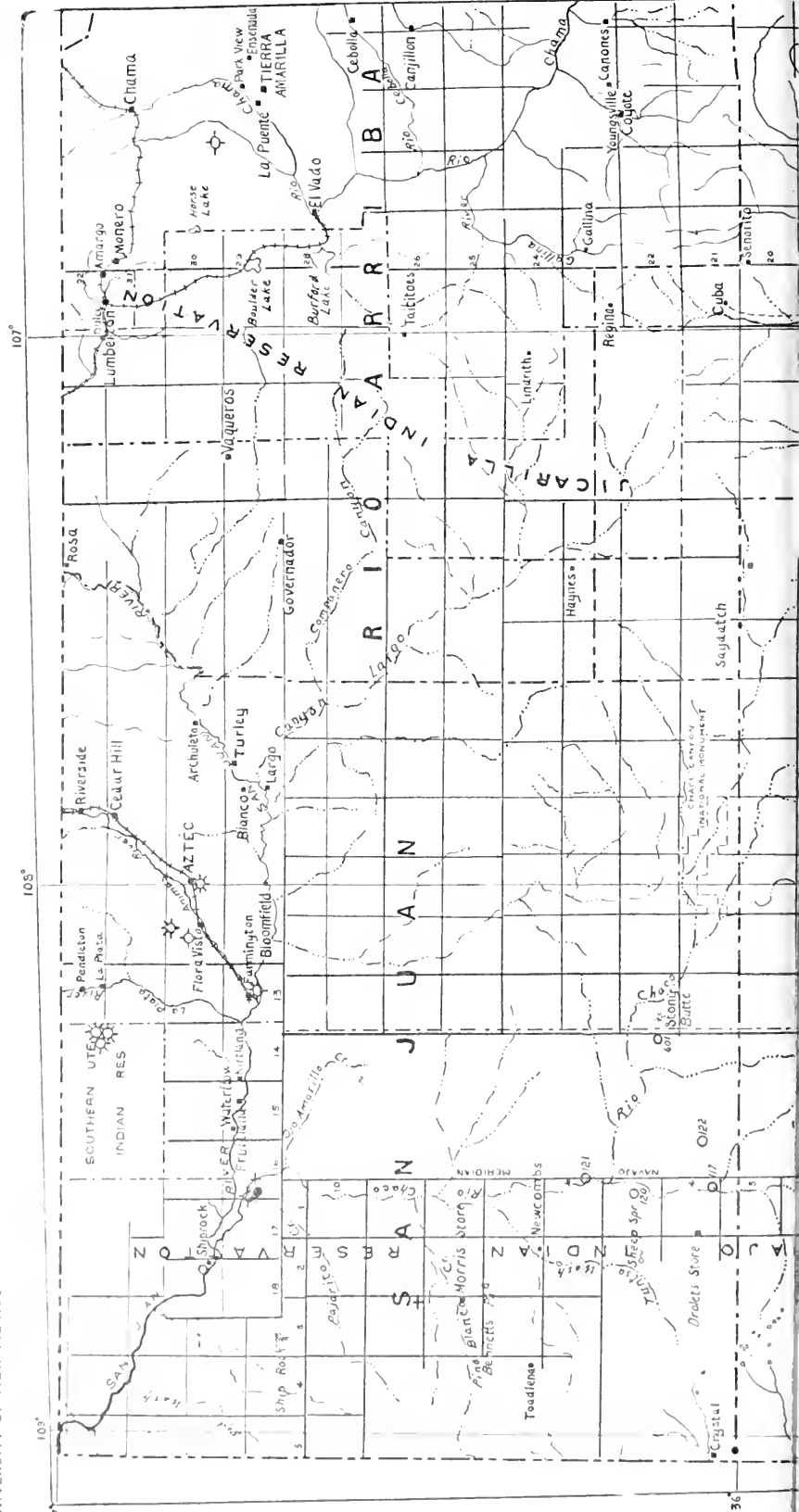
	Feet.
Surface	0- 20
Sand, light brown	20- 55
Gray sand	55- 85
Gray shale	85- 115
Shale	115- 190
Sand	190- 200
Gray sand	200- 220
Blue-black shale	220- 230
Gray shale	230- 260
Gray sandy shale	260- 290
Gray shale, sandy; gas at 625 feet	290-1125
Gray shale; small amount gas at 1600 feet	1125-1730
Black shale; thin "shell" at 1975 feet	1730-2020
Black shale	2020-2075
"Soapstone"	2075-2078
Black shale	2078-2095
Gray shale	2095-2120
Hard gray shale	2120-2130
Lime "shell"	2130-2135
Hard gray shale	2135-2145
Gray shale	2145-2205
"Shell" over sand	2205-2208
Sand	2208-2240
Hard sand	2240-2280
Soft sand and "breaks" of shale, black	2280-2285
Hard sand	2286-2322
Shale and sand	2322-2325
Shale	2325-2340
Sand	2340-2365
Sand, carrying gas	2365-2370
Soft sand, carrying gas	2370-2376
Sand, carrying gas	2376-2379
Sand	2379-2383
"Made 12 feet stringing in"	2383-2395
Gas sand, and shale partings	2395-2410
Hard "shell" and sand	2410-2419
Gas sand	2419-2420
Gas sand, with shale partings	2420-2428
(mudded off)	

The combined capacity of these two wells is said to be 20,000,-000 to 30,000,000 cubic feet of gas.

About 30 rods south of the wells of the Midwest Refining Company, is a third well. This was drilled by W. E. Lockhart. The location is the northwest quarter of section 1, T. 31 N., R. 14 W. The well was commenced March 4, 1923, and was completed on April 23, 1923. Its depth is 2,385 feet. From 2,370 feet the rock pressure was 700 pounds and the tested capacity was 70,000,000 cubic feet. *The elevation of the mouth of this well is 6,425 feet, which is on slightly lower ground than the other two wells. A log is given below:

Log of Lockhart's Ute well No. 1, N. W. $\frac{1}{4}$ sec. 1, T. 31 N., R. 14 W., Ute Indian Reservation, N. Mex.

	Feet.
Surface	0- 10
Shale	10- 60
"Shells" and shale	60- 70
Sandy, dry	70- 187
Sandy shale; little water at 310	187- 320
Shale	320-1100



	Feet.
"Shells and shale	1100-1200
Shale	1200-1520
"Shells" and shale	1520-1540
Shale	1540-2020
"Shells" and shale, gray	2020-2050
Shale, green, hard	2050-2160
Sand; 250,000 feet of gas at 2180.....	2160-2180
Broken sand and "shells"; small amount of gas at 2215; 1,250,000 feet of gas at 2280	2180-2280
Shale, black	2280-2320
White sand; 5,000,000 feet of gas at 2340.....	2320-2340
Sand and "shells"	2340-2360
White gas sand; 70,000,000 feet of gas and a rock pres- sure of 700 lbs. from 2370 to 2385.....	2360-2385

The oil well which comes nearest to being commercially productive of any ever drilled in New Mexico, and which has caused a revival of interest in the oil possibilities of the State, is the one completed in the early fall of 1922 by the Midwest Refining Company. This well is located on what is known as the "Hog-back" structure, so named from its association with the Hog-back ridge running southwest from the San Juan River half-way between Farmington and Shiprock. A second well was later completed on the same structure.

This structure comprises about 24,000 acres and lies wholly within the Navajo Indian Reservation. The crest of the structure is well toward the southeastern corner, and there the wells are located. This location is about 15 miles southeast of Shiprock—sec. 19, T. 29 N., R. 16 W. It is reached by a good road from Shiprock. From Farmington the road has a very sandy arroyo to cross. The wells are situated on a terrace of the San Juan River about 2 miles from that river. They are immediately on the south edge of Rio Chaco, which enters the San Juan River a few miles farther northwest.

Well No. 1 is at the edge of a small arroyo near its junction with Rio Chaco. These arroyos have cut down about 100 feet in the terrace, exposing the structure of the underlying sediments to that depth. This well is 777 feet deep. Oil was struck in considerable quantity at 775 feet. On flowing into the tanks water appeared with the oil. The water troubles were so serious that neither the company nor the Bureau of Mines was able to overcome them. The well is now cemented off and is not producing. It was estimated to produce 360 barrels, but no accurate measurement was made, on account of lack of facilities for storage. The oil is of a very high grade—said to be 60° Baumé.

Well No. 2 is located about 1,000 feet northwest of No. 1 and on about the same level. It was drilled to a depth of 783 feet.

No oil or gas was encountered in this well. Operations ceased on these wells March 16, 1923.

Hogback well No. 3 has been located in N. W. $\frac{1}{4}$ sec. 20, T. 29 N., R. 16 W. It is 3,987 feet east and 375 feet north of well No. 1.

Log of Midwest well No. 1, Hogback structure, S. W. $\frac{1}{4}$ N. E. $\frac{1}{4}$ sec. 19, T. 29 N., R. 16 W.

	Feet.
Sandstone, yellow, solid	0-40
Shale	40-60
Sandstone and shale	60-100
Sandy shale	100-150
.....	150-200
Sandy shale	200-280
Hard "shell"	280-290
Light gray shale	290-330
Black shale, soft	330-470
Gray shale, soft	470-500
Black shale, soft	500-600
Gray shale, soft	600-700
Hard "shell"	700-705
Soft gray shale	705-730
Soft gray shale	730-772
Coarse sand	772-775
(flowing)	

Log of Midwest well No. 2, Hogback structure, S. W. $\frac{1}{4}$ N. E. $\frac{1}{4}$ sec. 19, T. 29 N., R. 16 W.

	Feet.
Soil	0-10
Shale	10-20
Sandstone, yellow, known as Tocito sandstone.....	20-30
Sandstone, yellow	30-60
Shale, black	60-90
Shale, dark, sandy	90-130
Shale, dark, sandy, soft	130-210
Shale, dark, sandy	210-300
Shale, dark	300-305
"Shell," hard	305-308
Shale, dark gray	308-480
.....	480-680
Shale, gray	680-760
"Soapstone"	760-765
Shale, gray	765-773
Sandstone	773-783
(dry hole)	

The Midwest Refining Company began drilling on the Miguel Creek structure, McKinley County, April 24, 1923. The location is in sec. 4, T. 15 N., R. 6 W. On May 15, 1923, the hole was 400 feet deep, in brown shale. Water had been abundant below 65 feet and was hindering progress. It was planned to use 20-inch casing for the first 500 feet.

Mr. H. F. Robinson, superintendent of the United States Indian Irrigation Service, has furnished the following records of

water wells, most of which are located on the Navajo Indian Reservation;

Log of Tohatchi well—Government well No. 113—about 15 miles south-east of Tohatchi, middle of T. 17 N., R. 18 W.

	Feet.
Sand and clay	0- 80
Fine sand	80- 102
Shale	102- 104
Tough blue clay	104- 112
Shale and shallow layers rock	112- 174
Light gray sandstone, hard	174- 186
Shale and slate	186- 192
Light gray sandstone, hard	192- 225
Shale	225- 234
Sandstone	234- 236
Shale	236- 242
Slate, hard	242- 250
Sandstone	250- 262
Shale	262- 285
Sandstone, extraordinarily hard	285- 288
Sandstone, loose	288- 298
Coal; water rose to 28 feet of surface.....	298- 299
Shale, tough and sticky	299- 332
Shale	332- 340
Sandstone	340- 342
"Slate," very hard	342- 356
Sandstone	356- 357
Shale	357- 398
Sandstone; water rose to 20 feet of surface.....	398- 402
Shale	402- 428
Shale, sandstone, and coal	428- 436
Gallup fire clay	436- 446
Rock, dark, very hard; carrying mineral.....	446- 454
Light gray sandstone	452- 620
Fire clay	620- 622
Light gray sandstone	622- 684
Dark brown sandstone	684- 702
Fire clay	702- 722
Light gray sandstone	722- 742
Fire clay	742- 753
Light gray sandstone	753- 774
Fire clay	774- 800
Sandstone; thin layer of coal	800- 816
Fire clay	816- 906
Light gray sandstone; water over casing.....	906- 943
Coal	943- 946
Light gray sandstone	946- 949
Fire clay	949- 955
Dark, close-grained rock, hard	955- 964
Fire clay	964- 988
Shale	988-1001
Close-grained sandstone, hard	1001-1018
Fire clay, very tough and sticky	1018-1035
Close-grained sandstone, very hard	1035-1050
Light yellow sandstone; water flow	1050-1058
Light gray sandstone	1058-1082
Light yellow sandstone; heavy flow	1082-1094
Light gray sandstone; flow 6000 gals. per hr.....	1094-1108
Shale	1108-1150

Log of Government well No. 114, in Coyote Canyon, about 15 miles southeast of Tohatchi Indian School.

	Feet.
Clay, mostly yellow	0- 44
Clay and rock; water at 50 feet	44- 54
Clay, mostly blue	54- 82
Sandstone; water rises	82- 90
Sandstone, red, hard	90-113
Clay, blue	113-142

	Feet.
Sandstone, gray	142-150
Fire clay	150-170
Sandstone, gray	170-176
Coal	176-178
Sandstone	178-200
Flow	200-201

(Water rose from 42 feet to top of 5½-inch pipe and flows over at the rate of 500 gals. per hour.)

Log of Government well No. 116, about 8 miles northeast of well No. 113.

	Feet.
Sandy soil	0- 3
Sandy clay	3- 10
Yellow clay	10- 34
Sandy yellow clay	34- 44
Sandy rock, coarse	44- 48
Blue clay	48- 82
Sandy rock, gray	82- 94
Fire clay	94-122
Sandstone	122-128
Fire clay	128-150
Rock, black, hard	150-151
Fire clay	151-159
Fire clay, yellow	159-200
Sandy rock; little water	200-201
Fire clay	204-265
Sandstone	265-520
Shale	520-530

Log of Government well No. 117, 12 miles north of well No. 116.

	Feet.
Clay	0- 20
Rock	20- 30
Fire clay	30- 50
Clay, yellow	50- 60
Fire clay	60- 80
Sandstone	80- 90
Fire clay	90-138
Sandstone	138-160
Fire clay	160-200
Sandstone; water	200-205
Fire clay	205-315
Sandstone; flow	315-352
Fire clay	352-366
Sandstone	366-372
Clay, yellow	372-376
Sandstone	376-394
Clay, yellow	394-396
Sandstone	396-406
Fire clay	406-414
Sandstone; flow	414-438
Clay, yellow	438-444
Sandstone	444-450
Fire clay	450-458
Sandstone; flow	458-470
Clay, light yellow	470-490
Fire clay	490-500
Sandstone; flow, 2,000	500-532
Coal	532-540
Sandstone	540-542
Slate and shale	542-550

(A few inches of coarse sandstone was encountered at 294, where water rose over top of casing.)

Log of Government well No. 118, near Hastquin Yazhe's, about 8 miles east of well No. 116.

	Feet.
Clay	0- 10
Sandstone	10- 12
Clay	12- 14
Rock	14- 16
Fire clay	16- 18
Rock, hard, dark	18- 22
Fire clay	22- 28
Sandstone	28- 30
Coal	30- 32
Sandstone	32- 34
Fire clay	34-136
Sandstone	136-140
Fire clay	140-152
Sandstone, coarse-grained	152-182
Fire clay	182-415
Sandstone; more flow	415-417
Fire clay	417-497
Shale	497-499
Rock, dark	499-502
Shale	502-505
Sandstone; water	505-507
Fire clay	507-525
Sandstone; more flow	525-539
Fire clay	539-543
Shale	543-555

Log of Government well No. 119, about 9 miles east of well No. 116.

	Feet.
Sandy soil	0- 2
Clay	2- 12
Broken rock	12- 14
Clay	14- 26
Sandstone	26- 50
Fire clay	50- 80
Sandstone	80- 82
Fire clay	82-145
Sandstone; flow	145-152
Fire clay	152-162
Sandstone; more flow	162-182
Fire clay	182-228
Sandstone, coarse-grained; no water	228-258
Fire clay	258-410

Log of Government well No. 120, 7 miles east of Charles Newcomb's store.

	Feet.
Sandy soil	0- 5
Clay, dark yellow	5- 20
Clay, dark	20- 40
Fire clay	40- 63
Rock and coal; first water	63- 66
Fire clay	66- 70
Broken rock	70- 76
Clay and rock	76- 78
Fire clay	78-128
Rock, hard	128-130
Fire clay	130-190
Sandstone	190-192
Fire clay	192-205
Sandstone; flow	205-210
Fire clay	210-220
Sandstone	220-224
Fire clay	224-248
Slate	248-250
Fire clay	250-260
Sandstone; more flow	260-262
Fire clay	262-356

	Feet.
Shale	356-362
Sandstone	362-366
Fire clay	366-396
Sandstone	396-400
Fire clay	400-420
Sandstone; more flow	420-426
Fire clay	426-438
Shale	438-440
Fire clay	440-442
Shale	442-450
Fire clay	450-454
Shale	454-458

Log of Government well No. 502, Laguna Reservation, 350 feet south of depot.

	Feet.
Soil	0- 4
White sandstone	4- 32
Gray sandstone	32- 55
Red sandstone	55-112
Red clay	112-243
'Crystallized' gypsum	243-267
Gypsum	267-304
(surface of ground to water, 40 feet)	

Log of Government well, sec. 10, T. 17 N., R. 13 W.

	Feet.
Brown sand	50- 75
Brown shale	75- 90
Coal	90- 95
"Slate"	95- 100
Sand	100- 205
Brown shale	205- 220
Sand	220- 300
Shale and sand	300- 520
Sand	520- 565
Sand and shale	565- 620
Sand	620- 722
Sand and shale	722- 797
Sand	727- 805
Shale and sand	805-1055
Sandy lime	1055-1065
Sand and shale	1065-1200
Sand, hard	1200-1202
Shale	1202-1205

Log of Government well No. 601, Stony Butte, 20 miles east of Manning's store, Navajo Indian Reservation, N. Mex.

	Feet.
Clay and rock	0- 10
Black shale	10- 86
Hard rock	86- 90
Sandstone, soft; water	90- 94
Shale, brown	94-144
Sandstone, gray; water rose to 56-ft. level	144-175
Shale, brown	175-180
Hard rock	180-182
Shale, black	182-222
Hard rock	222-225
Shale, black	225-310
Sandstone, gray	310-315
Shale, blue	315-350
Sandstone, gray; water flow	350-370
Shale, blue	370-398
Sandstone, gray; water flow	398-406
Shale, brown	406-435
Sandstone, gray; water flow	435-494
Shale, brown	494-517
Sandstone, gray; flow	517-525
Shale, blue	525-550

Log of Government well No. 602, near the hogan of Charley Jesus, 12 miles north of Peach Springs, Navajo Indian Reservation, N. Mex.

	Feet.
Clay and rock	0- 10
Clay	10- 52
Blue shale	52- 70
Brown shale	70- 86
Hard rock	86- 90
Shale	90-168
Gray sandstone; water	168-179
Shale	179-258
Gray sandstone	258-263
Shale	263-285
Gray sandstone; water rose to 30 feet	285-303
Shale	303-393
Gray sandstone	393-401
Shale	401-604
Gray sandstone	604-632
Shale	632-696
Gray sandstone; water rose to 8 feet	696-713
Shale	713-734
Gray sandstone	734-738
Shale	738-750
Gray sandstone	750-760
Shale	760-790
Gray sandstone	790-820
Shale	820-850
Coal	850-852
Gray sandstone; flow	852-887
Shale	887-900

Log of Government well No. 603, 2 miles west of Newman's ranch, in "Moon Water Valley," Navajo Indian Reservation, N. Mex.

	Feet.
Broken rock	0- 4
Clay	4- 30
Clay, with traces of coal	30- 38
Blue shale	38- 45
Coal	45- 47
Blue shale	47- 70
Clay and coal	70- 75
Gray sandstone	75- 89
Hard rock	89- 91
Blue shale	91-101
Gray sandstone	101-126
Blue shale	126-130
Gray sandstone; water rose to 120 feet	130-205
Blue shale	205-238
Hard rock	238-241
Blue shale	241-268
Black shale	268-490
Gray sandstone; flow	490-504
Blue shale	501-510
Coal	510-514
Blue shale	514-516
Coal	516-518
Blue shale	518-530
Sandstone, chalky	530-555
Blue shale	555-575
Gray sandstone; water flow	575-588
Blue shale	588-596

Log of Government well No. 604, 1 mile of Dalton Pass store, Navajo Indian Reservation, N. Mex.

	Feet.
Soil	0- 12
Clay and rock	12- 40
Blue shale	40- 63
Gray sandstone; small amount of water, 80 feet.....	63- 88
Blue shale	88- 200
Gray sandstone; water, no rise above 80 feet.....	200- 210
Coal	210- 212
Black shale	212- 244
Gray sandstone; water rose to 68 feet.....	244- 252
Blue shale	252- 265
Gray sandstone; water rose to 64 feet	265- 276
Blue shale	276- 300
Clay sandstone; water rose to 53 feet.....	300- 306
Black shale	306- 655
Brown shale, with thin layers of sandstone.....	655- 680
Gray sandstone; very fine water rose to 52 feet.....	680- 710
Black shale	710- 820
Brown sandstone; water rose to surface.....	820- 830
Black shale	830- 850
Gray sandstone; water, no rise	850- 865
Black shale	865- 868
Gray sandstone; water, flow	868- 920
Black shale	920-1014

Log of Government well No. 605, sec 10, T. 17 N., R. 13 W., Government Farm, Crownpoint, N. Mex.

	Feet.
Clay	0- 6
Coal, poor quality	6- 9
Black shale	9- 50
Gray sandstone; water rose to 45 feet	50- 82
Hard sandstone	82- 84
Gray sandstone; water, no rise above 45 feet.....	84- 118
Black shale	118- 130
Gray sandstone; water, no rise above 45 feet.....	130- 236
Blue shale	236- 560
Gray sandstone, water, rose to 2 feet	560- 605
Brown shale	605- 687
Gray sandstone and shale; water flow	687- 740
Brown shale	740- 745
Dirty sandstone	745- 765
Shale and sandstone	765- 776
Gray sandstone	776- 835
Blue shale	835-1040
Gray sandstone	1040-1042
Blue shale	1042-1100
Layers of sandstone and shale	1100-1196

This well flowed 1,050 gallons per hour, but it was not known from what stratum the flow came. The water is "hard," with sulphur and iron. The well was finished, June 30, 1922.

A well recently finished at the Shiproek Indian school has a flow of 20 gallons of water per minute and a closed pressure of 110 pounds. This well has 540 feet of 5½-inch casing and 998 feet of 6-inch; none below 998 feet. No oil or gas was encountered.

Log of water well at Shiprock Indian School, Shiprock, N. Mex.

	Feet.
Sand and gravel deposit of river.....	0- 40
Shale, dark	40- 275
Sandstone, fine-grained quartz; salty water.....	275- 288
Sandstone, hard, gray	288- 295
Shale, dark	295- 327
Sandstone, fine-grained, brittle, light gray.....	327- 332
Shale, dark	332- 620
Shale, dark, containing variable amounts of "talc"....	620- 978
Sandstone, flour-grained, very dense, gray, strong sulphur water, flowing 1 gallon per minute.....	978- 998
Shale, black, hard	998-1010
Shale, brown, containing fine grains of sand.....	1010-1030
Sandstone, flour-grained, gray; sulphur water	1030-1037
Shale, dark, with occasional streaks of brown	1037-1103
Sandstone, "Dakota"; flow of 10 gallons per minute....	1103-1121
"Talc", light color	1121-1126
Shale, light green	1126-1128
Shale, red	1128-1134
Coal	1134-1134½
"Talc", light green	1134½-1139
Shale, brown	1139-1144
Coal	1144-1146
"Talc", white	1146-1148
Shale, brown	1148-1150
"Talc", white	1150-1152
Shale, light color	1152-1160
Sandstone, white; 2d sand of the Dakota, with flow of 10 gallons per minute of good water.....	1160-1169
Shale, red	1169-1170
"Talc", light, with spots of brown	1170-1200

CONCLUSIONS.

Up to the present time the great amount of exploration that has been done has failed to demonstrate conclusively the presence of oil in this State in quantities sufficient to become commercially important. The hopes that were raised at the apparent success of the Midwest Company on the Hogback structure, have not been realized, although the results obtained in well No. 1 have suggested the possibility of finding more favorable occurrences of oil in other parts of the San Juan region. That portion of the State is being more thoroughly explored than ever before, and numerous wells are being projected. On January 22, 1923, there were pending in the office of the superintendent of the Navajo Indian Agency, at Shiprock, 90 applications for permission to negotiate with the Tribal Council for leases.

It is supposed that the suspension of work on the Hogback structure is due to the lack of storage and transportation facilities. The full possibilities of this well can, therefore, hardly be said to have been demonstrated. At the present time progress in development of the area is somewhat delayed, pending final arrangements with the Government and the Indians for the leasing of lands on the Navajo Indian Reservation.

More promising than the indications for oil in this State, are the prospects for gas. The results of drilling at Aztec and near

La Plata give evidence of large possibilities in gas production for the northern part of San Juan County. Of course, it is not to be supposed that the presence of gas in such abundance necessarily signifies that oil is present in commercial quantities.

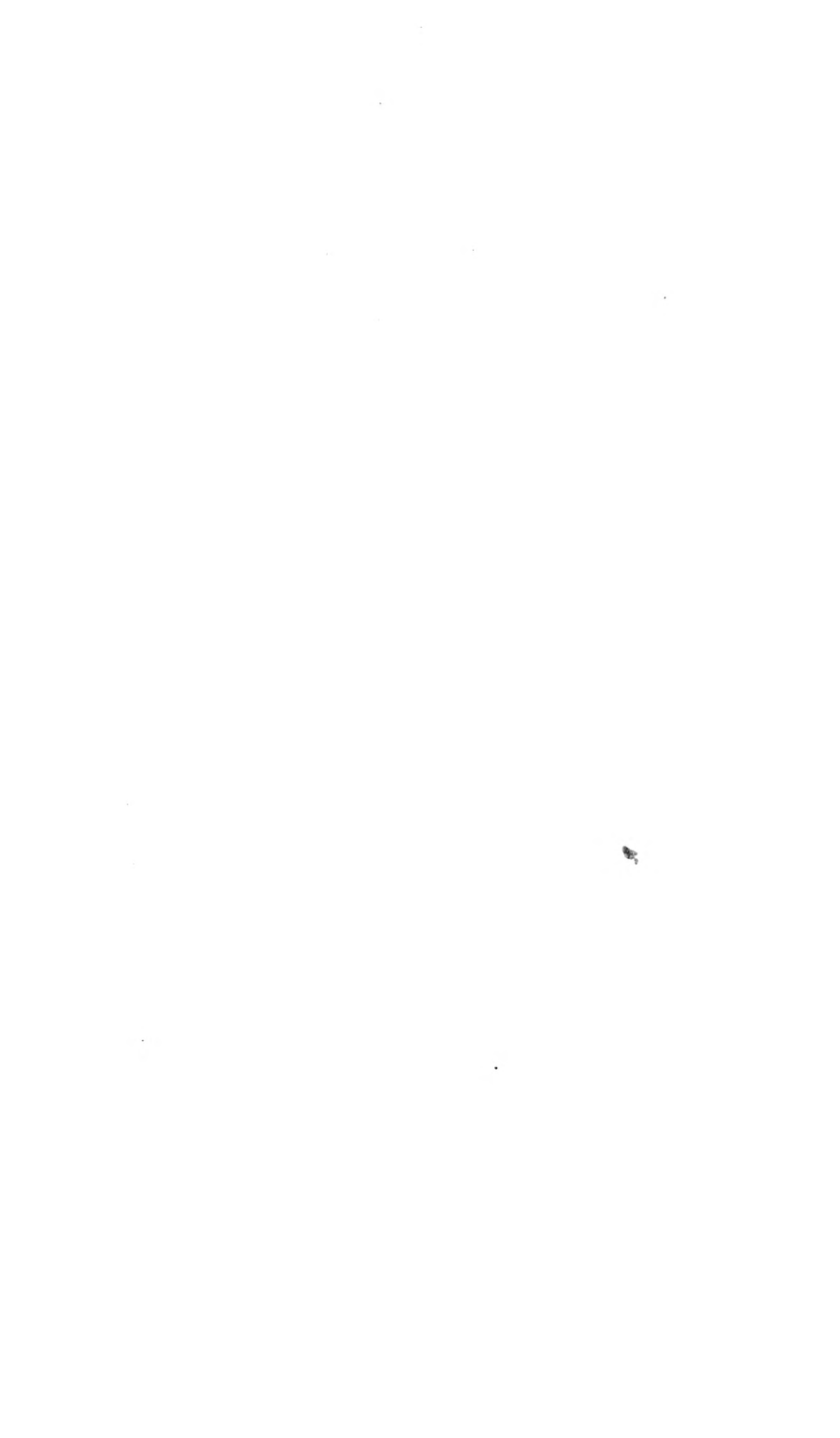
That favorable structures are to be found in the San Juan Basin, there is no question. But what has not yet been shown, is the presence or absence of a definite formation suitable for the accumulation of oil, along with carbonaceous deposits of sufficient magnitude to furnish a large supply of oil. Some geologists claim to have traced the Frontier formation from Wyoming, through Colorado, to New Mexico. While it may be possible that a certain horizon is represented here, it does not necessarily follow that a richly petroliferous formation in another State occurs here equal in thickness and in all other respects.

The logs of the water wells made by the United States Indian Irrigation Service generally show strong flows of water, but it is noticeable that none of them shows a trace of oil or gas. It is not likely, however, that these wells were located with respect to structures suitable for the accumulation of oil. The depths of most of them are too shallow to give a very decisive test for the presence of oil in those localities.

The present outlook for a moderate production of oil and gas in the State may be said to be rather more encouraging than the outlook in 1920. The San Juan Basin continues to be the most promising of any part of the State, and this region seems to hold the center of interest.

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